

Report of the Kew Committee for the Year ending December 31, 1892.

The operations of The Kew Observatory, in the Old Deer Park, Richmond, Surrey, are controlled by the Kew Committee, which is constituted as follows :

Mr. F. Galton, *Chairman.*

Captain W. de W. Abney, C.B., R.E.	Prof. A. W. Rücker.
Prof. W. G. Adams.	Mr. R. H. Scott.
Captain E. W. Creak, R.N.	Lieutenant-General R. Strachey, C.S.I.
Prof. G. C. Foster.	General J. T. Walker, C.B.
Admiral Sir G. H. Richards, K.C.B.	Captain W. J. L. Wharton, R.N.
The Earl of Rosse, K.P.	

The serious illness of Mr. Whipple has prevented his performing the duties of Superintendent during the last half-year. During this period the work of the Observatory was very satisfactorily carried out by Mr. Baker, the Chief Assistant, and the Committee are of opinion that his services should be specially recorded, and they are glad to state that the routine work of the Observatory has in no way suffered in these circumstances.

The work at the Observatory may be considered under the following heads:—

- 1st. Magnetic observations.
- 2nd. Meteorological observations.
- 3rd. Solar observations.
- 4th. Experimental, in connexion with any of the above departments.
- 5th. Verification of instruments.
- 6th. Rating of Watches and Marine Chronometers.
- 7th. Miscellaneous.

I. MAGNETIC OBSERVATIONS.

There have been no changes introduced in the magnetographs during the past year, but during the erection of the additional story to the west wing of the Observatory the self-recording instruments were at times disturbed by the building operations. Fortunately the indications of the instruments were seriously affected by these causes on one of the "quiet days" only, and that day has been omitted in calculating the monthly mean.

The building in which the absolute observations are made is sufficiently remote (about 100 yards) from the main building to be quite unaffected by these sources of magnetic disturbance.

The photographed magnetic curves representing Declination, Horizontal Force, and Vertical Force variations have been secured uninterruptedly throughout the year, and, as usual, the scale values of all the instruments were determined in January last.

The following values of the ordinates of the different photographic curves were then found:—

Declinometer: 1 inch = $0^{\circ} 22' 04''$. 1 cm. = $0^{\circ} 8' 7''$.

Bifilar, January 5, 1892, for 1 inch $\delta H = 0.0280$ foot grain unit.

„ 1 cm. „ = 0.00050 C.G.S. unit.

Balance, January 7, 1892, for 1 inch $\delta V = 0.0287$ foot grain unit.

„ 1 cm. „ = 0.00052 C.G.S. unit.

In the case of the Vertical Force magnetometer, it was found necessary to readjust the instrument; at the same time its sensibility was slightly altered, after which the scale value was again determined with the following result:—

Balance, January 15, 1892, for 1 inch $\delta V = 0.0277$ foot grain unit.

„ 1 cm. „ = 0.00050 C.G.S. unit.

The distance between the dots of light upon the Horizontal Force cylinder having become too large for satisfactory registration, the trace dot was brought nearer to the zero dot on August 6.

The principal magnetic disturbances were recorded on the following dates, viz.:—February 13—14, March 6 and 12, April 26, May 18, July 16—17, and August 12.

The most marked disturbance, however, was that which commenced on February 13 at 5.34 A.M., and lasted until the afternoon of the 14th.

The oscillations were of a more extended and violent character than any which have been recorded during the last ten years.

From the insufficient range of the scale, the magnetometers did not record the complete extent of the vibrations to which the needles were subjected, nor could the entire change of force be secured in the field of the instrument.

The limits, however, clearly recorded, were $1^{\circ} 40'$ of declination, from 0.1755 to 0.1835 of horizontal force, and from 0.4350 to 0.4425 units of vertical force expressed in C.G.S. measure in absolute force.

The following table exhibits the absolute hourly values of Declination (Inclination calculated from the Horizontal and Vertical Forces), the Horizontal Force and Vertical Force having both been corrected for temperature for February 13, 14, and 15, 1892:—

Hour.	Declination.			Inclination.		
	Feb. 13.	Feb. 14.	Feb. 15.	Feb. 13.	Feb. 14.	Feb. 15.
1 A.M..	17 34'·7	18 31'·7	17 39'·5	67 31'·2	° ..	67 33'·6
2 " ..	35'·9	17 56'·7	38'·4	30'·9	67 43'·7	33'·5
3 " ..	37'·7	27'·7	38'·7	30'·5	36'·2	33'·2
4 " ..	38'·9	38'·2	38'·7	30'·2	40'·0	33'·0
5 " ..	38'·9	52'·7	40'·6	29'·8	42'·5	32'·5
6 " ..	39'·7	40'·6	38'·9	29'·9	38'·4	32'·1
7 " ..	33'·7	38'·7	40'·7	29'·9	38'·2	32'·4
8 " ..	32'·1	35'·2	38'·7	29'·1	37'·7	34'·0
9 " ..	35'·1	34'·7	36'·7	28'·3	36'·3	32'·9
10 " ..	24'·0	34'·5	37'·7	30'·6	37'·9	34'·2
11 " ..	47'·7	36'·2	39'·2	33'·5	37'·2	33'·1
Noon...	36'·7	38'·2	40'·7	38'·0	36'·9	33'·6
1 P.M...	21'·7	41'·7	42'·7	33'·4	34'·7	32'·4
2 " ..	28'·7	42'·4	40'·7	35'·6	33'·7	32'·9
3 " ..	37'·8	41'·2	38'·7	36'·3	34'·9	29'·6
4 " ..	33'·7	41'·2	37'·8	30'·9	36'·5	32'·4
5 " ..	17'·8	40'·7	37'·3	..	35'·7	33'·6
6 " ..	16'·7	40'·2	36'·6	34'·3	34'·7	32'·6
7 " ..	45'·5	39'·9	42'·7	32'·2	34'·8	35'·2
8 " ..	50'·7	39'·0	39'·7	36'·1	34'·5	33'·5
9 " ..	42'·1	39'·5	39'·7	38'·9	34'·5	31'·5
10 " ..	58'·7	37'·7	39'·7	58'·7	34'·4	31'·6
11 " ..	17 37'·7	36'·9	35'·7	40'·8	34'·3	33'·3
Mid ...	18 7'·5	41'·1	36'·7	30'·4	34'·4	32'·9

Hour.	Horizontal force.			Vertical force.		
	Feb. 13.	Feb. 14.	Feb. 15.	Feb. 13.	Feb. 14.	Feb. 15.
1 A.M..	0·18184	0·17622	0·18144	0·43943	trace off sheet	0·43934
2 " ..	0·18188	0·17872	0·18147	0·43914	0·43638	0·43938
3 " ..	0·18194	0·18066	0·18151	0·43943	0·43838	0·43936
4 " ..	0·18193	0·18038	0·18155	0·43942	0·43908	0·43938
5 " ..	0·18204	0·17977	0·18161	0·43941	0·43851	0·43936
6 " ..	0·18197	0·18070	0·18167	0·43927	0·43928	0·43936
7 " ..	0·18192	0·18087	0·18162	0·43914	0·43961	0·43933
8 " ..	0·18206	0·18097	0·18137	0·43922	0·43969	0·43933
9 " ..	0·18225	0·18121	0·18156	0·43938	0·43976	0·43936
10 " ..	0·18182	0·18099	0·18135	0·43917	0·43978	0·43933
11 " ..	0·18145	0·18117	0·18151	0·43934	0·44000	0·43931
Noon...	0·18086	0·18119	0·18144	0·43952	0·43993	0·43933
1 P.M...	0·18185	0·18152	0·18170	0·44024	0·43993	0·43952
2 " ..	0·18184	0·18174	0·18167	0·44104	0·44011	0·43962
3 " ..	0·18202	0·18175	0·18222	0·44174	0·44053	0·43978
4 " ..	0·18312	0·18137	0·18182	0·44244	0·44020	0·43981
5 " ..	0·18298	0·18142	0·18165	trace off sheet	0·44003	0·43983
6 " ..	0·18248	0·18152	0·18172	0·44212	0·43991	0·43966
7 " ..	0·18261	0·18146	0·18125	0·44164	0·43983	0·43945
8 " ..	0·18161	0·18150	0·18154	0·44064	0·43981	0·43954
9 " ..	0·18107	0·18149	0·18182	0·44038	0·43978	0·43951
10 " ..	0·17773	0·18150	0·18172	0·43944	0·43978	0·43931
11 " ..	0·18061	0·18149	0·18145	0·43994	0·43971	0·43925
Mid	0·18134	0·18146	0·18156	0·43794	0·43969	0·43936

The following are the principal results of the magnetic elements for the year 1892:—

Mean Westerly Declination	17° 36'·7
Mean Horizontal Force	0·18202 C.G.S. unit.
Mean Inclination	67° 29'·4
Mean Vertical Force	0·43919 C.G.S. unit.

Additional observations of the Horizontal Force, Inclination, and Declination have been made each month with the absolute instruments, for the purpose of determining with greater precision the zero values of the magnetograph curves.

Information on matters relating to various magnetic data has been supplied to Lord Kelvin, P.R.S., Professor Rücker, Dr. Neumayer, Captain Schück, and Dr. Atkinson.

Lieutenant C. E. Monro, of H.M.S. "Penguin," visited the Observatory from November 11 to 22, in order to gain a knowledge of the use of the unifilar magnetometer and the method of observing and reducing the observations.

Mr. E. Kitto, Superintendent of the Falmouth Observatory, again spent a fortnight at Kew, in the spring, preparing for the reduction, upon the International scheme, of the magnetic observations made at that Observatory.

From time to time Messrs. Gray and Watson have visited the Observatory for the purpose of taking a series of absolute magnetic observations with the instruments which have been employed under the direction of Professors Rücker and Thorpe in their magnetic survey of the British Isles.

A glass scale graduated in millimetres for measuring magnetic curves was constructed for Professor W. G. Adams.

A number of Thomson compass deflectors by J. White, of Glasgow, have been examined, the examination being conducted at the Observatory by Mr. Baker, acting upon suggestions made by Captain Creak.

II. METEOROLOGICAL OBSERVATIONS.

The several self-recording instruments for the continuous registration respectively of Atmospheric Pressure, Temperature of Air and Wet-bulb, Wind (direction and velocity), Bright Sunshine, and Rain, have been maintained in regular operation throughout the year, and the standard eye observations for the control of the automatic records duly registered.

The tabulations of the meteorological traces have been regularly made, and these, as well as copies of the eye observations, with

notes of weather, cloud, and sunshine, have been transmitted, as usual, to the Meteorological Office.

With the sanction of the Meteorological Council, data have been supplied to the Council of the Royal Meteorological Society, the editor of 'Symons's Monthly Meteorological Magazine,' Dr. Rowland, the Institute of Mining Engineers, and others.

Detailed information of all thunderstorms observed in the neighbourhood during the year has been forwarded to the Royal Meteorological Society, as usual.

At the request of the Meteorological Council, experiments have been for some months in progress upon the spare Beckley Rain Gauge with Willesden prepared paper and aniline ink, with the view of determining its adaptability for use with that instrument, as a substitute for the paper hitherto used, which has been found to deteriorate on keeping.

Daily trials were carried out, and the results showed a marked improvement upon those previously obtained. It was found impossible, however, to entirely prevent the lengthening of the papers during very damp weather, although the sheets were soaked and coated with various varnishes, &c. Experiments are still in progress on this subject.

Various suggestions for a supplemental record of the number of discharges made by the Beckley Rain Gauge during heavy rainfalls have been under consideration, but nothing definite has, up to the present, been decided upon.

Anemograph.—A new pricker was fitted to this instrument in June, the old one having become bent and loose in its fitting.

Sunshine Records.—As it was found that the scaffolding erected during the extension of the west wing interfered with the registration of bright sunshine by the recorder after 6 P.M., a spare instrument was obtained on loan from the Meteorological Office, and fitted up on the staging above the sun room, in order to prevent any possible loss of record, and was in use from August 2 to September 10, the scaffolding being removed on the latter date.

Alterations in Observatory.—To facilitate photographic operations, and to keep the thermograph free from disturbance, &c., the curtains heretofore used in the room have been removed, and a wooden partition with two doors erected, which has been found a great improvement. At the same time, arrangements were made so as to render the room available for the registering portion of the electrograph, and the two instruments are now conveniently placed side by side.

Inspections.—At the commencement of March Mr. Whipple visited the Valencia Observatory, and after dismounting the whole of the meteorological instruments, conveyed them to the new building

constructed for the purpose at Westwood House, Cahirciveen, the new Valencia Observatory. The removal was successfully accomplished with only one breakage, that of the wet-bulb reference thermometer. Before leaving, Mr. Whipple made careful determinations of the level of the barometer at the new station, the heights of anemometer cups, rain gauges, and thermometers above ground, re-determined index errors, &c.

At the request of the Meteorological Council, Mr. Baker visited the Glasgow Observatory in April, taking with him three new thermograph tubes and two Kew standard thermometers of reference, in order to replace instruments which had been maliciously broken.

Electrograph.—This instrument was kept in action until the end of July, when it was dismantled to prevent possible damage during the building operations connected with the extension of the west wing of the Observatory. The scale value was determined by direct comparison with the portable electrometer, No. 53, early in May and at the end of June. On the completion of the building, the instrument being in a somewhat inconvenient spot, rendering dislocation possible, it was decided to remove it to a safer position, which was rendered accessible by the alterations to the thermograph room. The water reservoir, however, was not moved, as this might perhaps have interfered with the continuity of the records, and it is intended to commence again the regular records with the beginning of 1893.

III. SOLAR OBSERVATIONS.

Sun-spots.—Sketches of Sun-spots have been made on 178 days, and the groups numbered after Schwabe's method.

On no occasion during the year, when observations have been taken, has the Sun's surface been found free from spots, and the number of new groups enumerated has largely increased.

Time Signals.—These have been regularly received from Greenwich through the G.P.O., with the exception of a few days, on which occasions supplementary signals were transmitted at later hours, and a list of time corrections sent when required.

Transit Observation.—Occasional solar and sidereal transits have been observed as checks upon the Greenwich signalled times.

Violle's Actinometer.—With regard to these instruments, the only observations made during the past year were experiments to determine the rate of cooling both of the spheres and the thermometers used in connection with them. The weight of each sphere also was determined when filled with water. The results were forwarded to Mr. H. F. Blanford, F.R.S., who had undertaken to investigate the subject for the Solar Physics Committee.

IV. EXPERIMENTAL WORK.

In accordance with the request of Mr. Ellery, the Government Astronomer at Melbourne, the Indian pendulum apparatus, having been thoroughly overhauled since its return from the Royal Observatory, Greenwich, to Kew, was carefully packed and shipped to Melbourne, for use in the Gravity Survey now being undertaken by the Australian authorities.

The packing and shipping were conducted under the direction of General Walker, who prepared a detailed statement of the necessary instructions to be followed by the observers.

The Richard thermograph, procured for use with the apparatus, was also carefully packed and sent to Melbourne. Notice has been received of the arrival in the Colony of the apparatus.

Cloud Photographs.—Operations connected with cloud photography have been suspended during the past year. At the request of the Meteorological Office, certain cloud negatives taken in 1891, with their reductions, were forwarded to them for examination, as well as the apparatus used in the reduction of their heights and velocities.

Fog and Mist.—With the view of ensuring greater uniformity in observations of these phenomena, at the suggestion of Mr. R. H. Scott, a list of twenty-four well-known objects in the neighbourhood of the Observatory has been prepared, at distances varying from 9 to 3850 yards. Since May, the most distant of the objects visible at each observation hour between sunrise and sunset has been noted. Up to the present the most dense fog recorded was when an object at 20 yards distance was obscured.

Further experiments were made at the beginning of the year with Munro's sight indicating anemometer, but the variation of viscosity of the oil at low temperatures has caused some difficulty in determining the scale value of the instrument, which has been returned to the maker.

V. VERIFICATION OF INSTRUMENTS.

The following instruments have been purchased on commission and their constants determined :—

1 pair of dip needles, for the Meteorological Institute, Copenhagen.

1 pair of dip needles for the Imperial and Royal Austro-Hungarian Embassy, London.

1 Clifton electrometer, water dropping collector and insulators, also a battery of 60 chloride of silver cells and a dip needle for the Royal Alfred Observatory, Mauritius.

A set of 24 thermometers for the Observatory, Hong Kong.

The total number of other instruments compared during the year was as follows :—

	Number tested in the year ending December 31, 1892.	Number tested during the fourteen months ending December 31, 1891.
Air-meters	9	7
Anemometers	4	19
Aneroids	74	72
Artificial horizons.....	22	10
Barometers, Marine.....	74	111
„ Standard	61	57
„ Station.....	18	39
Binoculars	168	470
Compasses.....	28	22
Deflectors	20	0
Hydrometers.....	395	224
Inclinometers	1	3
Photographic Lenses	18	19
Magnets.....	1	2
Navy Telescopes	487	374
Rain Gauges.....	9	17
Rain Measures.....	13	39
Sextants.....	463	428
„ Shades	52	7
Sunshine Recorders.....	1	1
Theodolites	6	5
Thermometers, Arctic.....	50	133
„ Avitreous or Immisch's	71	231
„ Chemical	44	108
„ Clinical	16,850	15,692
„ Deep sea.....	31	58
„ Meteorological	1,875	2,289
„ Mountain	17	26
„ Solar radiation	1	1
„ Standards	79	62
Unifilers	1	3
Vertical Force Instruments.....	5	0
Total.....	<u>20,948</u>	<u>20,529</u>

Duplicate copies of corrections have been supplied in 78 cases.

The number of instruments rejected on account of excessive error, or for other reasons, was as follows :—

Thermometers, clinical	32
" ordinary meteorological	13
Sextants	83
Telescopes	90
Various	21

3 Standard Thermometers have been supplied during the year.

There were at the end of the year in the Observatory undergoing verification, 12 Barometers, 202 Thermometers, 8 Hydrometers, 13 Sextants, 21 Telescopes, and 1 Anemometer.

At the request of Captain Tyler, R.E., Inspecting Officer of the R.E. Division, Royal Dockyard, Woolwich, a batch of 72 telescopes for the use of the officers of the field artillery has been examined.

VI. RATING OF WATCHES.

1044 watches have been sent for examination during the year, as contrasted with 709 during the fourteen months comprised in last report. They were entered for the following classes:—

For class A, 414; class B, 403; class C, 221; and 6 for the subsidiary trial. Of these 192 failed from various causes to gain any certificate; 214 were awarded class C certificates, 377 class B, and 256 class A; of the latter, 22 obtained the highest form of certificate, class A, *especially good*; and 5 of the 6 passed the second test.

In the Appendix will be found statements giving the results of trial of the 22 watches which gained the highest number of marks during the year. The first place was taken by Messrs. Baume and Co., London, with a keyless, going-barrel, chronometer-watch, No. 103,018, with the "tourbillon" escapement, which obtained the high total of 91·9 marks out of a maximum of 100; this is the highest value yet awarded.

The best performance of *lever* watches during the year was that of No. 13,400 by Fridlander, Coventry, which gained 86 marks.

There has been a marked increase in the number of watches sent for the B and C trials, and the use of these tests for lower-graded movements appears, judging by the demand, to be steadily growing in favour.

Non-Magnetic Watches.—Several watches thus designated have been examined during the year, both as to their ordinary time-keeping and also to their non-magnetic properties. The trial is rigorous, the movement being tested in an intense magnetic field, both in vertical and horizontal positions, and gradually approached to and removed from the coil, whilst its behaviour is critically watched, and its subsequent daily rate noted. Should any alterations of its normal performance occur, the watch receives no certificate.

Marine Chronometers.—During the year, 9 class A and 9 class B certificates have been issued with chronometers which had undergone the tests, as described in last report; one movement failed to pass the trials.

VII. MISCELLANEOUS.

Lens Testing.—A detailed account of the apparatus and methods employed in the examination of lenses has been completed by Major Darwin, and presented to the Royal Society. The paper is being printed *in extenso* by several photographic journals. Major Darwin also read a paper on this subject before the Photographic Society of Great Britain, the apparatus being illustrated by means of lantern slides. The Lens Testing Camera was shown at the Soirée of the Royal Society, in May.

A loan of twelve lenses, all known to be of good quality, has been obtained from the Royal Engineering School at Chatham, by the kind permission of the Commandant. These have been subjected to a very detailed examination, the results of which will be considered as standards of reference for other lenses sent here for certification.

Experiments are in progress in the endeavour to find an object more suitable for the “definition” test than the one now in use.

Library.—During the year the library has received as presents the publications of—

37 Scientific Societies and Institutions of Great Britain and Ireland, and

106 Foreign and Colonial Scientific Establishments, as well as of numerous private individuals.

The preparation of the card catalogue of the Library is still continued, but confined only to such publications as relate to Meteorology, Terrestrial Magnetism, and the other work of the Observatory.

Extension of the Building.—The Chief Commissioner of Works and Public Buildings having granted permission for the Committee to undertake the erection of the additional story to the west wing of the Observatory, as mentioned in last year’s Report, and having instructed Mr. Lessels, surveyor to the Board, to prepare the necessary drawings, plans, &c., tenders were invited from the principal local builders for the work. That of Messrs. J. Dorey and Co., of Brentford, for £540, was accepted, and operations were commenced on July 15. They have now been completed, under the superintendence of Mr. Chart, H.M. Commissioners’ Clerk of Works for the Hampton Court and Kew District, and Mr. Allen, his assistant.

The cost of the operations being a heavy charge on the funds at the present disposal of the Committee, they made application to the Royal Society for a loan of £400, which was liberally granted.

During the building alterations the thermometer testing was carried on in the experimental magnetic house.

Water Supply.—Applications having been made to Her Majesty's Office of Works for the provision of a direct water supply, available for the protection of the building in the case of fire and other purposes, arrangements were made with the Water Committee of the Richmond Corporation for the laying of a branch main along the roadway leading from Clarence Street, Richmond, to the Observatory, and H.M. Office of Works contributed a moiety of the cost, viz., £74 10s.

Paper.—Prepared photographic paper has been procured, and supplied to the Observatories at Aberdeen, Falmouth, Fort William, Lisbon, Mauritius, Oxford, Stonyhurst, Valencia, Hong Kong, Toronto, as well as to the Meteorological Office for Batavia.

Anemograph sheets have been sent to Mauritius, and blank forms for entry of magnetic observations to Professor Rücker and Dr. Meldrum.

Exhibition of Instruments.—Various instruments were shown by the Committee at the thirteenth annual exhibition of the Royal Meteorological Society.

Workshop.—The machine tools procured for the use of the Kew Observatory by grants from the Government Grant Fund or the Donation Fund have been duly kept in order.

House, Grounds and Footpath.—These have all been kept as usual during the year.

PERSONAL ESTABLISHMENT.

The staff employed is as follows:—

G. M. Whipple, B.Sc., Superintendent.		
T. W. Baker, Chief Assistant.		
H. McLaughlin, Accounts and Library.		
E. G. Constable, Observations and Rating.		
W. Hugo, Verification Department.		
J. Foster	„	„
T. Gunter	„	„
W. J. Boxall	„	„
E. Dagwell, and seven other Assistants.		

(Signed) FRANCIS GALTON,
Chairman.

Comparison of Expenditure (excluding Commissions) for the twelve months ending December 31st, 1891, and December 31st, 1892.

Net expenditure.	1891.	1892.	Increase.	Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Administration—</i>				
Superintendent.....	400 0 0	400 0 0		
Office	207 1 6	200 3 0	..	6 18 6
Rent, fuel, and lighting	53 7 7	58 15 10	5 8 3	
Attendance and contingencies	191 13 9	184 12 10	..	7 0 11
<i>Normal Observatory—</i>				
Salaries	284 4 8	296 12 0	12 7 4	
Incidental expenses..	49 5 5	31 14 11	..	17 10 6
<i>Researches—</i>				
Salaries	221 6 0	223 5 0	1 19 0	
Incidental expenses..	28 1 8	2 11 0	..	25 10 8
<i>Tests—</i>				
Salaries	876 14 6	858 17 7	..	17 16 11
Incidental expenses..	260 2 10	183 15 2	..	76 7 8
<i>Extension of Premises—</i>				
West wing.....	..	500 0 0	500 0 0	
Water main .....	..	156 10 0	156 10 0	
			676 4 7	151 5 2
			151 5 2	
	2,571 17 11	3,096 17 4	524 19 5	

Kew Observatory. Account of Receipts and Payments for the year ending December 31st, 1892.

<i>Dr.</i>	RECEIPTS.		PAYMENTS.		<i>Cr.</i>
	£	s. d.	£	s. d.	
To Balance from Year 1891.....	380	6 10			
Royal Society:—					
(Gasston Trust).....	437	10 0	Superintendent	400	0 0
(Loan for Building)	400	0 0	Salaries, Wages, &c.	200	3 0
Meteorological Council:—			Rent, Fuel, and Lighting.....	58	15 10
Allowance.....	400	0 0	Attendance, Cleaning, Repairs, Insurance, &c.	184	12 10
Postages, &c.	3	3 11			843 11 8
Researches.....			Normal Observatory:—		
Tests:—			Salaries—Observations, Tabulations, &c.	296	12 0
Verifications	1214	18 4	Incidental Expenses—Instruments, Postages, &c. ...	31	14 11
Rating	633	18 8	Researches:—		
Lenses.....	7	17 9	Salaries—Observations, Reductions, &c.	223	5 0
H.M.'s Office of Works, Share of Water Main.....			Incidental Expenses—Instruments, Postages, &c. ...	2	11 0
Commissions executed for Colonial and Foreign Institutions, &c.					225 16 0
	1866	14 9	Tests:—		
	74	10 0	Salaries	858	17 7
	243	18 4	Incidental Expenses—Instruments, Postages, &c.	183	15 2
			Printing, &c.		1042 12 9
			Extension of Premises:—		
			West Wing	500	0 0
			Water Main from Richmond to the Observatory	156	10 0
			Commissions executed for Colonial and Foreign Institutions, &c. ...		656 10 0
			Balance:—		222 8 3
			Cash at Bank of England	327	18 10
			London and County Bank, Richmond.....	112	10 0
			" Observatory (for Banking).....	76	13 3
			" " (Petty Cash)	12	0 8
					88 13 11
					529 2 9
					43848 8 4

February 6, 1893.

Examined and compared with the vouchers, and found correct.

(Signed)

W. GRYLLS ADAMS, Auditor.

ESTIMATED ASSETS.

	£	s.	d.
By Balance as per Statement	529	2	9
Payments:—			
Neurological Council—Allowance, Postage, &c.	109	14	11
Test Fees.	841	11	2
Commissions	34	16	8
Stock:—			
Blank Forms and Certificates	48	16	9
Standard Thermometers	87	16	0
	136	12	9
	£1152	8	3

February 27, 1893.

ESTIMATED LIABILITIES.

	£	s.	d.
To Administration accounts—Gas, Repairs and Contingencies.....	40	1	2
Observatory accounts—A.G.B. Paper, Chemicals, &c.	35	17	3
Tests accounts—Fittings, Printing, Stationery, &c.	23	6	0
Unspent Balance of Fundulum Account	117	1	7
Royal Society (Loan)	400	0	0
Dorey & Co.—Balance for Building	40	0	0
Commissions	43	16	9
General Balance	452	5	6
	£1152	8	3

(Signed)

T. W. EAKER,

Chief Assistant.

List of Instruments, Apparatus, &c., the Property of the Kew Committee, at the present date out of the custody of the Superintendent, on Loan.

To whom lent.	Articles.	Date of loan.
G. J. Symons, F.R.S.	Portable Transit Instrument	1869
The Science and Art Department, South Kensington.	The articles specified in the list in the Annual Report for 1876, with the exception of the Photo-Heliograph, Dip-Circle, Unifilar, and Hodgkinson's Actinometer.	1876
R. J. Ellery, F.R.S..	Pendulum Apparatus, complete, with Richard Thermograph.	1892
Professor W. Grylls Adams, F.R.S.	Unifilar Magnetometer, by Jones, No. 101, complete.	1883
	Pair 9-inch Dip-Needles with Bar Magnets . . .	1887
Professor O.J. Lodge, F.R.S.	Unifilar Magnetometer, by Jones, No. 106, complete.	1883
	Barrow Dip-Circle, No. 23, with two Needles, and Magnetizing Bars.	
	Tripod Stand.	
Captain W. de W. Abney, F.R.S.	Mason's Hygrometer, by Jones	1885
Prof. T. E. Thorpe, F.R.S.	Tripod Stand	1886
Lord Rayleigh, F.R.S.	Standard Barometer (Adie, No. 655)	1885
Mr. C. Eldridge	Chain Anemometer	1890

APPENDIX I.

MAGNETICAL OBSERVATIONS,

Made at the Kew Observatory, Richmond, Lat. $51^{\circ} 28' 6''$
N. and Long. $0^{\text{h}} 1^{\text{m}} 15^{\text{s}}.1$ W., height 34 feet above mean
sea-level, for the year 1892.

The results given in the following tables are deduced from the magnetograph curves which have been standardised by observations of deflection and vibration. These were made with the Collimator Magnet K.C. I. and the Declinometer Magnet marked K.O. 90 in the 9-inch Unifilar Magnetometer by Jones.

The Inclination was observed with the Inclinator by Barrow, No. 33, and needles 1 and 2, which are $3\frac{1}{2}$ inches in length.

The Declination and Force values given in Tables I to VIII are prepared in accordance with the suggestions made in the fifth report of the Committee of the British Association on comparing and reducing Magnetic Observations.

The following is a list of the days during the year 1892 which were selected by the Astronomer Royal, as suitable for the determination of the magnetic diurnal variations, and which have been employed in the preparation of the magnetic tables.

January	2, 9, 20, 22, 30.
February	3, 8, 17, 18, 22.
March	10, 14, 17, 18, 23.
April.....	5, 6, 17, 20, 22.
May	12, 13, 15, 23, 26.
June	8, 9, 12, 14, 15.
July	5, 6, 8, 20, 23.
August.....	11, 14, 15, 19, 30.
September	4, 5, 9, 12, 25.
October.....	9, 17, 23, 26, 28.
November.....	8, 11, 12, 16, 27.
December.....	3, 9, 18, 26 27.

Table I.—Hourly Means of Declination, as

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
(17° +) West.						Winter.						
1892. Months.	/	/	/	/	/	/	/	/	/	/	/	/
Jan. ..	38·0	37·9	37·6	37·4	37·5	37·6	37·8	38·0	37·6	37·9	39·5	41·4
Feb. ..	37·6	37·4	37·7	37·5	37·9	37·3	38·3	38·2	38·3	38·6	40·0	41·6
March ..	37·1	37·3	37·4	37·3	37·4	37·8	37·5	36·0	35·2	35·6	37·5	40·6
Oct. ..	32·3	32·7	32·9	33·0	32·8	33·1	32·6	32·4	31·3	31·0	32·6	35·9
Nov. ..	32·9	33·2	33·2	33·2	33·1	32·7	32·9	32·9	32·6	32·3	32·7	34·7
Dec. ..	32·2	32·5	32·8	32·9	33·0	33·2	32·6	32·8	32·7	33·1	34·4	35·9
Mean.	35·0	35·2	35·3	35·2	35·3	35·3	35·3	35·1	34·6	34·8	36·1	38·4
Summer.												
April ..	36·4	36·2	35·7	35·7	35·4	34·8	33·9	32·6	31·7	31·9	34·6	37·4
May ..	37·0	36·9	36·7	36·2	35·3	33·7	32·5	31·8	32·6	34·4	37·5	40·5
June ..	36·1	35·8	35·8	35·7	34·3	32·3	31·0	30·6	31·1	33·0	35·9	39·4
July ..	37·1	36·8	35·7	35·4	34·5	32·5	31·3	31·4	31·2	32·3	34·5	37·7
Aug. ..	35·6	35·4	35·5	34·6	34·2	33·1	31·6	30·9	31·2	33·1	36·7	40·1
Sept. ..	35·3	35·1	34·8	34·5	34·1	33·6	32·7	32·4	32·6	34·6	38·2	41·3
Mean.	36·3	36·0	35·7	35·4	34·6	33·3	32·2	31·6	31·7	33·2	36·2	39·4

Table II.—Solar Diurnal Range of the Kew

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Summer Mean.												
	-0·5	-0·8	-1·1	-1·4	-2·2	-3·5	-4·6	-5·2	-5·1	-3·6	-0·6	+2·6
Winter Mean.												
	-1·7	-1·5	-1·4	-1·5	-1·4	-1·4	-1·4	-1·6	-2·1	-1·9	-0·6	+1·7
Annual Mean.												
	-1·1	-1·2	-1·3	-1·5	-1·8	-2·5	-3·0	-3·4	-3·6	-2·8	-0·6	+2·2

NOTE.—When the sign is + the magnet

determined from the selected quiet Days in 1892.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Winter.												
'	'	'	'	'	'	'	'	'	'	'	'	'
43·3	44·1	43·4	42·1	41·1	40·2	39·6	39·1	38·5	38·1	38·1	37·9	38·2
43·5	44·1	44·2	43·4	41·3	40·2	40·8	40·0	39·1	38·2	37·9	37·7	37·8
43·8	45·1	44·2	42·9	41·0	39·7	38·6	38·0	38·0	37·2	37·0	37·9	38·0
39·2	41·0	41·0	39·7	37·8	36·5	35·3	34·6	34·3	33·6	33·5	33·5	33·5
36·3	37·1	37·0	36·3	36·1	35·2	34·7	34·3	33·9	33·1	33·3	33·1	33·1
37·0	37·7	36·5	36·2	35·1	34·8	34·9	34·1	33·3	32·7	32·2	32·0	32·2
40·5	41·5	41·1	40·1	38·7	37·8	37·3	36·7	36·2	35·5	35·3	35·4	35·5
Summer.												
'	'	'	'	'	'	'	'	'	'	'	'	'
40·8	42·1	42·3	40·7	39·1	38·2	37·6	37·4	37·4	37·1	37·1	36·8	36·5
44·0	45·1	43·8	42·0	40·1	38·1	36·9	36·5	36·8	37·3	37·5	37·2	36·9
42·7	44·2	44·0	42·1	40·4	38·9	37·8	36·9	36·8	36·6	36·8	36·5	36·2
41·3	43·3	43·7	42·4	39·9	38·0	36·7	36·4	36·4	36·8	36·7	36·5	36·5
43·5	44·8	43·6	41·6	38·7	36·6	35·8	36·2	35·9	35·9	35·9	35·5	34·9
43·8	43·8	42·5	40·5	38·4	37·0	36·7	36·5	35·9	35·6	36·1	35·9	35·5
42·7	43·9	43·3	41·6	39·4	37·8	36·9	36·7	36·5	36·5	36·7	36·4	36·1

Declination as derived from Table I.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+5·9	+7·1	+6·5	+4·8	+2·6	+1·0	+0·1	-0·1	-0·3	-0·3	-0·1	-0·4	-0·7
Winter Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+3·8	+4·8	+4·4	+3·4	+2·0	+1·1	+0·6	0·0	-0·5	-1·2	-1·4	-1·3	-1·2
Annual Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+4·9	+6·0	+5·5	+4·1	+2·3	+1·1	+0·4	-0·1	-0·4	-0·8	-0·8	-0·9	-1·0

points to the west of its mean position.

Table III.—Hourly Means of the Horizontal Force in C.G.S. units

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
0·18000 + Winter.												
1892. Months.												
Jan. ..	188	189	191	190	194	195	194	194	189	184	176	172
Feb. ..	195	190	195	189	187	189	189	195	194	186	179	175
March ..	193	193	191	192	192	198	201	193	186	172	169	164
Oct. ..	209	208	210	212	212	213	214	212	204	192	183	182
Nov. ..	222	220	221	224	225	226	227	227	222	213	209	208
Dec. ..	210	209	210	211	216	216	218	218	215	212	206	204
Mean.	203	202	203	203	204	206	207	207	202	193	187	184
Summer.												
April ..	201	201	200	200	199	199	198	194	186	175	166	166
May ..	219	216	213	214	212	214	208	200	190	183	181	184
June ..	224	221	221	221	221	219	213	203	194	190	191	200
July ..	201	200	198	198	197	194	189	183	179	174	167	168
Aug. ..	207	208	206	206	205	203	202	193	182	171	168	171
Sept. ..	196	196	194	193	193	192	189	179	169	164	162	168
Mean ..	208	208	205	205	204	204	200	192	183	176	172	176

NOTE.—During July, August, and September the Horizontal Force Magnetograph was at quiet days (August 30) this disturbance was such as to make the indications of the instrument August depends on four days only.

Table IV.—Diurnal Range of the Kew

Hours.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Summer mean.												
	+·00007	+·00007	+·00004	+·00004	+·00003	+·00003	—·00001	—·00009	—·00018	—·00025	—·00029	—·00025
Winter mean.												
	+·00001	+·00000	+·00001	+·00001	+·00002	+·00004	+·00005	+·00005	+·00000	—·00009	—·00013	—·00018
Annual mean.												
	+·00004	+·00004	+·00003	+·00003	+·00003	+·00004	+·00002	—·00002	—·00009	—·00017	—·00022	—·00021

NOTE.—When the sign is + the

(corrected for Temperature), as determined from the selected Days in 1892.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Winter.												
179	184	188	188	189	190	195	197	197	196	192	195	195
174	179	180	185	190	191	199	196	200	200	198	199	201
166	173	179	189	186	185	192	200	198	193	194	199	199
184	196	202	204	204	209	211	214	216	215	216	218	218
209	212	218	222	222	225	227	229	227	228	229	227	229
204	206	210	211	214	217	217	218	219	216	215	218	214
186	192	196	200	201	203	207	209	210	208	207	209	209
Summer.												
173	182	190	194	200	201	203	206	204	204	205	204	204
192	200	206	212	218	221	223	224	220	222	222	220	219
209	213	220	225	221	225	228	231	231	230	230	227	226
170	180	193	200	207	209	212	214	214	213	210	208	207
183	192	199	206	213	217	220	221	222	223	219	222	217
183	193	197	196	192	193	197	202	201	201	198	202	200
185	193	201	206	208	211	214	216	215	215	214	214	212

times disturbed by the building operations which were then in progress. On one of the selected doubtful. The results obtained on that date have therefore been omitted, and the mean for

Horizontal Force as deduced from Table III.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer mean.												
-00016	-00008	00000	+00005	+00007	+00010	+00013	+00015	+00014	+00014	+00013	+00013	+00011
Winter mean.												
-00016	-00010	-00006	-00002	-00001	+00001	+00005	+00007	+00008	+00006	+00005	+00007	+00007
Annual mean.												
-00016	-00009	-00003	+00001	+00003	+00006	+00009	+00011	+00011	+00010	+00009	+00010	+00009

reading is above the mean.

Table V.—Hourly Means of the Vertical Force in C.G.S. units (corrected

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
0.43000 + Winter.												
1892.												
Months.												
Jan. ..	938	938	936	935	934	934	934	934	935	935	936	935
Feb. ..	914	911	910	911	912	913	915	914	915	912	909	907
March ..	927	927	927	927	927	927	925	925	926	922	917	910
Oct. ..	911	909	908	909	911	912	913	915	916	915	910	905
Nov. ..	930	931	930	930	931	931	931	930	932	932	928	925
Dec. ..	911	911	912	912	913	914	913	913	913	913	913	913
Mean ..	922	921	921	921	921	922	922	922	923	922	919	916
Summer.												
April ..	921	921	921	922	923	924	925	928	926	919	913	906
May ..	931	933	934	936	939	941	941	939	934	927	918	912
June ..	913	913	914	915	919	922	920	919	915	909	903	893
July ..	911	910	910	911	913	916	913	909	908	905	900	895
Aug. ..	906	907	908	907	909	912	914	914	912	907	899	894
Sept. ..	918	918	919	920	920	922	924	924	921	914	907	903
Mean ..	917	917	918	919	921	923	923	922	919	914	907	901

NOTE.—During July, August, and September the Vertical Force Magnetograph was at times days (August 30) this disturbance was such as to make the indications of the instrument doubtful on four days only.

Table VI.—Diurnal Range of the Kew

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Summer mean.												
	+ .00002	+ .00002	+ .00003	+ .00004	+ .00006	+ .00008	+ .00008	+ .00007	+ .00004	— .00001	— .00008	— .00014
Winter mean.												
	·00000	— .00001	— .00001	— .00001	— .00001	·00000	·00000	·00000	+ .00001	·00000	— .00003	— .00006
Annual mean.												
	+ .00001	·00000	+ .00001	+ .00002	+ .00003	+ .00004	+ .00004	+ .00003	+ .00002	·00000	— .00005	— .00010

NOTE.—When the sign is + the

for Temperature), as determined from the selected Days in 1892.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Winter.												
935	936	939	941	941	940	940	939	936	936	935	934	933
908	912	916	920	920	920	920	920	919	917	917	916	915
908	910	915	921	926	924	924	921	919	919	918	915	914
903	904	909	916	918	920	918	917	916	916	916	914	913
924	924	928	930	932	932	932	932	933	932	932	931	929
914	917	919	921	921	922	922	923	921	921	921	920	921
915	917	921	925	926	926	926	925	924	924	923	922	921
Summer.												
902	905	912	917	919	917	916	916	915	915	914	913	913
909	914	920	926	930	932	933	931	928	925	922	923	922
892	897	906	910	915	918	918	916	916	914	913	913	914
890	893	901	909	914	917	919	916	913	912	912	910	910
893	896	901	906	911	913	915	909	909	908	907	906	904
903	907	914	918	922	924	923	921	921	920	920	919	919
898	902	909	914	919	920	921	918	917	916	915	914	914

disturbed by the building operations which were then in progress. On one of the selected quiet The results obtained on that date have therefore been omitted, and the mean for August depends

Vertical Force as deduced from Table V.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer mean.												
- '00017	- '00013	- '00006	- '00001	+ '00004	+ '00005	+ '00006	+ '00003	+ '00002	+ '00001	- '00000	- '00001	- '00001
Winter mean.												
- '00007	- '00005	- '00001	+ '00003	+ '00004	+ '00004	+ '00004	+ '00003	+ '00002	+ '00002	+ '00001	- '00000	- '00001
Annual mean.												
- '00012	- '00009	- '00004	+ '00001	+ '00004	+ '00005	+ '00005	+ '00003	+ '00002	+ '00002	+ '00001	- '00001	- '00001

reading is above the mean.

Table VII.—Hourly Means of the Inclination, calculated

Hours.	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
67° + Winter.												
1892.	/	/	/	/	/	/	/	/	/	/	/	/
Months.	/	/	/	/	/	/	/	/	/	/	/	/
Jan....	30·8	30·7	30·5	30·6	30·3	30·2	30·3	30·3	30·6	31·0	31·5	31·8
Feb....	29·7	29·9	29·5	30·0	30·1	30·0	30·1	29·7	29·7	30·2	30·6	30·8
March.	30·1	30·1	30·3	30·2	30·2	29·8	29·6	30·1	30·6	31·4	31·5	31·6
Oct....	28·6	28·6	28·5	28·4	28·4	28·4	28·4	28·6	29·1	29·9	30·3	30·3
Nov. ...	28·3	28·5	28·4	28·2	28·1	28·0	28·0	28·0	28·4	29·0	29·1	29·1
Dec....	28·6	28·6	28·6	28·5	28·2	28·3	28·1	28·1	28·3	28·5	28·9	29·0
Mean.	29·3	29·4	29·3	29·3	29·2	29·1	29·1	29·1	29·4	30·0	30·3	30·4
Summer.												
April..	29·5	29·5	29·5	29·5	29·6	29·7	29·8	30·1	30·6	31·1	31·6	31·4
May...	28·5	28·8	29·0	29·0	29·2	29·1	29·5	30·0	30·5	30·8	30·7	30·3
June...	27·7	27·9	27·9	27·9	28·1	28·3	28·6	29·3	29·7	29·8	29·6	28·7
July...	29·2	29·2	29·3	29·4	29·5	29·8	30·0	30·3	30·5	30·8	31·1	30·9
Aug. ...	28·6	28·6	28·8	28·7	28·8	29·1	29·2	29·8	30·5	31·1	31·0	30·7
Sept. ...	29·7	29·7	29·9	30·0	30·0	30·1	30·3	31·0	31·6	31·7	31·7	31·1
Mean.	28·9	28·9	29·1	29·1	29·2	29·3	29·6	30·1	30·6	30·9	31·0	30·5

Table VIII.—Diurnal Range of the

Hours	Mid.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Summer Mean.												
	-0·4	-0·4	-0·2	-0·2	0·1	0·0	+0·3	+0·8	+1·3	+1·6	+1·7	+1·2
Winter Mean.												
	-0·1	-0·0	-0·1	-0·1	-0·2	-0·3	-0·3	-0·3	0·0	+0·6	+0·9	+1·0
Annual Mean.												
	-0·3	-0·2	-0·2	-0·2	-0·2	-0·1	0·0	+0·3	+0·7	+1·1	+1·3	+1·1

NOTE.—When the sign is +

from the Horizontal and Vertical Forces (Tables III and V).

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Winter.												
'	'	'	'	'	'	'	'	'	'	'	'	'
31·3	31·0	30·8	30·9	30·8	30·7	30·4	30·2	30·1	30·2	30·4	30·2	30·2
30·9	30·7	30·7	30·5	30·2	30·1	29·6	29·8	29·5	29·4	29·5	29·4	29·3
31·4	31·0	30·8	30·3	30·6	30·6	30·1	29·5	29·6	29·9	29·8	29·4	29·4
30·1	29·3	29·1	29·1	29·2	28·9	28·7	28·5	28·3	28·4	28·3	28·1	28·1
29·0	28·8	28·5	28·3	28·4	28·2	28·0	27·9	28·0	28·0	27·9	28·0	27·8
29·0	29·0	28·8	28·8	28·6	28·4	28·4	28·4	28·3	28·5	28·5	28·3	28·6
30·3	29·9	29·8	29·6	29·6	29·5	29·2	29·0	28·9	29·1	29·1	28·9	28·9
Summer.												
'	'	'	'	'	'	'	'	'	'	'	'	'
30·8	30·3	29·9	29·8	29·5	29·3	29·2	29·0	29·1	29·1	29·0	29·0	29·0
29·7	29·3	29·1	28·9	28·6	28·4	28·3	28·2	28·4	28·2	28·1	28·2	28·3
28·1	28·0	27·8	27·6	28·0	27·8	27·6	27·3	27·3	27·3	27·3	27·5	27·6
30·7	30·1	29·4	29·2	28·9	28·8	28·7	28·4	28·4	28·4	28·6	28·7	28·7
29·9	29·4	29·0	28·7	28·4	28·2	28·0	27·8	27·7	27·6	27·9	27·6	27·9
30·2	29·6	29·5	29·7	30·1	30·1	29·8	29·4	29·5	29·4	29·6	29·3	29·5
29·9	29·5	29·1	29·0	28·9	28·8	28·6	28·4	28·4	28·3	28·4	28·4	28·5

Inclination as deduced from Table VII.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Mid.
Summer Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+0·6	+0·2	-0·2	-0·3	-0·4	-0·5	-0·7	-0·9	-0·9	-1·0	-0·9	-0·9	-0·8
Winter Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+0·9	+0·5	+0·4	+0·2	+0·2	+0·1	-0·2	-0·4	-0·5	-0·3	-0·3	-0·5	-0·5
Annual Mean.												
'	'	'	'	'	'	'	'	'	'	'	'	'
+0·8	+0·4	+0·1	-0·1	-0·1	-0·2	-0·4	-0·6	-0·7	-0·7	-0·6	-0·7	-0·6

the reading is above the mean.

APPENDIX II.—Table I.
Mean Monthly Results of Temperature and Pressure for Kew Observatory.
1892.

Months.	Thermometer.					Barometer.*					Mean vapour-tension.			
	Mean.	Means of—				Absolute Extremes.								
		Max.	Min.	Max. and Min.	Absolute Extremes.			Mean.	Absolute Extremes.					
					Max.	Date.	Min.		Date.	Max.		Date.	Min.	Date.
1892.	°	°	°	°	°	d. h.	°	d. h.	ins.	d. h.	ins.	d. h.	ins.	in.
Jan....	37.1	41.1	32.6	36.9	51.9	29 3 P.M.	23.8	16 2 A.M.	29.878	30.541	25 { 11 P.M. Midt.	29.203	8 2 A.M.	.186
Feb. ...	39.3	43.9	34.4	39.2	52.9	7 8 "	19.2	17 7 "	29.810	30.545	13 9 A.M.	29.118	18 2 "	.200
March...	37.4	43.5	31.8	37.7	59.2	18 2 "	22.2	9 6 "	30.029	30.536	31 8 "	29.261	15 6 P.M.	.172
April...	46.3	56.5	36.9	46.7	68.7	5 3 "	27.9	15 7 "	30.017	30.526	1 1 "	29.503	16 5 A.M.	.211
May ...	54.5	63.9	45.1	54.5	80.7	31 2 "	31.2	7 4 "	30.005	30.409	12 6 "	29.632	3 6 P.M.	.291
June ...	57.7	66.4	48.9	57.7	80.7	10 1 "	38.2	15 4 "	30.006	30.429	8 9 "	29.525	23 9 A.M.	.338
July ...	59.5	67.4	52.3	59.9	77.0	3 Noon	46.7	21 5 "	30.018	30.353	24 8 "	29.548	20 0.25 "	.372
Aug....	61.3	69.4	53.4	61.4	79.3	17 5 P.M.	43.8	11 4 "	29.983	30.270	11 1 "	29.512	28 8 "	.410
Sept....	55.9	63.4	48.3	55.9	70.9	3 3 "	33.9	18 6 "	29.989	30.382	5 9 "	29.479	30 8 "	.359
Oct.....	45.4	51.6	39.6	45.6	58.9	29 2 "	28.3	26 6 "	29.724	30.332	19 9 "	29.278	6 4 P.M.	.256
Nov. ...	45.2	49.7	39.6	44.7	60.1	14 1 "	30.0	2 8 "	30.057	30.436	27 10 P.M.	28.626	3 0.10 A.M.	.271
Dec....	36.6	40.9	32.2	36.6	54.0	15 Noon	17.9	27 8 "	30.002	30.381	16 9 A.M.	29.439	11 2 P.M.	.186
Yearly Means }	48.0	54.8	41.3	48.1	..	....	..	....	29.956	..	....	..	....	.271

This Table is compiled from "Hourly Means," vol. 1892, of the Meteorological Office.
* Reduced to 32° at M.S.L.

Meteorological Observations.—Table II,
Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=over-cast).	Rainfall.*			Weather. Number of days on which were registered							Wind.† Number of days on which it was								
		Total.	Maxi- mum.	Date	Rain. †	Snow.	Hail.	Thun- der- storms.	Clear sky.	Over- cast sky.	Gales	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm
1892.		in.	in.	30	13	11	3	..	5	18	..	6	2	6	1	1	7	4	4	3
January.....	6.9	0.435	0.095	30	13	11	3	..	5	18	..	6	2	6	1	1	7	4	4	3
February.....	7.4	0.405	0.220	15	16	6	2	..	1	14	2	7	5	2	2	1	7	2	3	2
March.....	6.1	1.040	0.210	15	10	7	..	1	8	12	2	7	9	6	..	1	3	2	3	3
April.....	4.3	1.075	0.320	27	8	3	1	..	14	4	..	8	4	2	1	5	8	6	1	2
May.....	5.7	1.470	0.800	25	12	..	..	3	8	8	..	4	4	3	..	5	10	4	2	4
June.....	6.0	2.790	1.170	28	13	..	..	3	5	10	..	3	3	3	..	5	5	5	1	..
July.....	7.0	2.075	0.470	5	9	..	..	1	4	15	..	2	7	2	2	4	10	5	2	6
August.....	6.5	3.280	1.795	27	14	..	..	4	4	13	..	2	1	3	1	4	15	5	4	8
September...	7.0	3.180	1.005	29	14	..	..	2	2	15	..	2	2	1	..	3	8	6	2	6
October.....	6.6	3.630	1.090	30	22	..	..	..	3	11	..	8	2	4	1	3	5	4	1	10
November....	7.8	2.710	0.930	15	19	..	..	..	2	20	..	6	..	4	3	7	5	8	3	7
December...	6.8	1.180	0.330	1	13	..	..	..	5	15	..	4	..	9	2	..	5	8	..	..
Totals and means....	6.5	24.270			163	27	6	14	61	155	4	63	42	42	13	34	86	55	31	52

* Measured at 10 A.M. daily by gauge 1.75 feet above ground.

† As registered by the anemograph.

‡ The number of rainy days are those on which 0.01 inch rain or melted snow were recorded.

Meteorological Observations.—Table III.
Kew Observatory.

Months.	Bright Sunshine.				Maximum temperature in sun's rays. (Black bulb <i>in vacuo</i> .)			Minimum temperature on the ground.			Horizontal movement of the air.*	
	Total number of hours recorded.	Mean percentage of possible sunshine.	Greatest daily record.	Date.	Mean.	Highest.	Date.	Mean.	Lowest.	Date.	Average hourly velocity.	Greatest hourly velocity.
1892.	h. m.		h. m.		deg.	deg.	deg.	deg.	deg.		miles.	miles.
January	34 24	13	5 42	25	60	85	24	26	16 {	9	9·9	31
February	48 42	17	6 12	18	†	†	†	30	12	17	11·5	39
March	94 24	25	11 0	30	85	110	9	27	16 {	9	12·5	35 {
April	219 36	53	12 54	23	109	124	22	29	20 {	15	9·9	31
May	207 42	43	13 30	11	118	136	31	38	19	7	10·7	31
June	231 54	47	13 54	9	125	139	10	43	28	15	10·1	28
July	191 30	38	13 12	29	121	138	10	48	39	1	11·1	33
August	192 0	43	12 42	12	123	134	15	47	35	5	9·1	34
September	134 54	36	11 18	8	113	126	16	43	29	18	8·2	31
October	90 6	28	8 42	23	92	110	10	32	19 {	24	9·8	30
November.....	39 42	15	6 18	30	69	99	3	35	26	2	7·4	26
December.....	34 12	14	5 18	4	57	82	15	26	9	27	9·0	29
Totals and Means	1519 6	31	..	..	..	..	..	35	..	..	9·9	..

* As indicated by a Robinson's anemograph, 70 feet above the general surface of the ground.

† Read at 10 A.M., and entered to same day.

‡ Instrument dismounted.

Table IV.

Summary of Sun-spot Observations made at the Kew Observatory.

Months.	Days of observation.	Number of new groups enumerated.	Days apparently without spots.
1892.			
January	10	9	—
February.....	14	9	—
March	16	13	—
April	19	16	—
May.....	17	14	—
June	17	17	—
July.....	16	13	—
August	16	15	—
September.....	17	15	—
October.....	17	13	—
November.....	10	11	—
December	9	13	—
Totals for 1892	178	158	—

APPENDIX III.—Table I.

RESULTS OF WATCH TRIALS. Performance of the 22 Watches which obtained the highest number of marks during the year.

Watch deposited by	Number of watch.	Balance spring, escapement, &c.	Mean daily rate.				Mean variation of daily rate, \pm	Mean change of rate for 1° r.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks. 0—100.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.			Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
Baume & Co., London	103018	Single overcoil, g.b., "tourbillon" chronometer	secs. -0.8	secs. -0.6	secs. -0.7	secs. -0.4	secs. -0.2	secs. 0.26	secs. 0.03	secs. 2.5	secs. 34.3	secs. 17.8	91.9
Fridlander, Coventry	13400	Single overcoil, s.r., g.b. lever	+0.1	+1.1	+1.7	+0.7	-1.1	0.4	0.06	4.0	32.3	37.0	86.0
Usher & Cole, London	27694	Single overcoil, s.r., fusee	+1.7	+2.1	+1.3	+4.2	+4.6	0.3	0.06	4.7	33.7	35.2	84.6
Rotherham & Sons, Coventry	95485	Single overcoil, s.r., g.b.	+2.0	0.0	-0.2	-0.3	+1.9	0.5	0.03	7.5	30.0	35.9	83.9
Fridlander, Coventry	13564	Single overcoil, s.r., g.b. centre seconds ..	+2.2	+8.1	+4.6	+4.9	+5.7	0.4	0.04	8.5	31.3	34.2	83.0
Jos. White & Son, Coventry	33579	Single overcoil, s.r., g.b.	-0.8	+0.3	-0.4	+0.4	-1.6	0.4	0.09	5.2	31.7	37.0	82.8
Fridlander, Coventry	32776	Single overcoil, d.r., g.b.	+0.6	-0.8	+1.7	+1.1	-2.0	0.5	0.06	6.2	29.5	37.2	82.3
Jos. White & Son, Coventry	13322	Single overcoil, d.r., g.b. centre seconds ..	-0.9	1.8	+0.4	+4.2	-2.8	0.6	0.03	5.0	27.7	36.9	81.7
Fridlander, Coventry	13521	Single overcoil, s.r., g.b.	+2.3	+5.6	+2.9	+4.2	+3.7	0.5	0.07	7.2	30.5	36.3	81.9
Fridlander, Coventry	52777	Single overcoil, d.r., g.b.	-0.6	+0.3	+3.0	+3.9	-3.8	0.8	0.03	6.8	31.4	35.6	81.7
Weill & Co., London	92771	Single overcoil, d.r., g.b.	+3.6	+3.3	+3.0	+0.7	+0.8	0.5	0.05	5.2	29.5	35.4	81.5
Rotherham & Sons, Coventry	13394	Single overcoil, s.r., g.b.	-1.3	-4.3	-3.5	-0.0	-0.8	0.5	0.04	7.0	30.6	33.8	81.5
Holland, Rock Ferry	3563	Single overcoil, d.r., fusee, centre seconds ..	+2.1	+3.9	+2.7	+3.6	+0.2	0.6	0.04	5.7	28.6	35.7	81.4
Rotherham & Sons, Coventry	95468	Single overcoil, s.r., g.b.	+1.6	+1.5	-0.5	+0.4	-3.0	0.6	0.04	9.0	27.6	36.0	80.8
Rotherham & Sons, Coventry	92777	Single overcoil, s.r., g.b.	+3.1	+2.3	+5.1	+1.0	+2.0	0.5	0.06	9.0	29.3	35.5	80.8
Klaftenberger, London	10950	Single overcoil, s.r., g.b. minute chronograph	-0.5	+0.6	+0.5	-1.3	+1.2	0.6	0.06	6.7	28.2	36.8	80.7
Fridlander, Coventry	52742	Flat spring, s.r., fusee, traveller's (B.G.S. pattern)	-0.5	-2.8	+0.5	+0.5	-4.4	0.5	0.02	7.5	30.2	39.7	80.4
Usher & Cole, London	28037	Double overcoil, d.r., g.b. centre seconds ..	+2.9	+1.3	-2.5	+0.1	+0.9	0.6	0.04	7.5	27.5	34.4	80.4
Jos. White & Son, Coventry	33297	Single overcoil, s.r., g.b. centre seconds ..	-1.5	+3.1	+0.4	+1.6	+0.3	0.6	0.03	6.0	27.3	35.0	80.3
Usher & Cole, London	13555	Single overcoil, s.r., fusee, traveller's (B.G.S. pattern)	+4.7	+4.6	-0.0	+3.3	+3.7	0.5	0.06	7.7	29.7	34.6	80.3
Fridlander, Coventry	13565	Single overcoil, s.r., g.b. centre seconds ..	+2.1	+2.8	+5.9	+3.7	+1.3	0.6	0.03	5.8	27.7	34.8	80.2

In the above List, the following abbreviations are used, viz. :—s.r. for single roller; d.r. for double roller; g.b. for going barrel; + for gaining rate; - for losing rate.

APPENDIX III.—Table II.
Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Received from.	Marks awarded for			Total marks, 0—100.
			Variation.	Position.	Temperature.	
Minute chronograph, minute repeater, and perpetual calendar with moon's phases	24987	S. Smith and Son, London....	19.8	34.2	14.7	68.7
Minute and split seconds chronograph, and minute repeater.....	14492	H. Golay, London	22.1	33.2	6.7	62.0
Minute and seconds chronograph and minute repeater.....	52696	A. E. Fridlander, Coventry ...	30.6	33.7	14.1	78.4
" " " "	1979	A. Vuille, Chaux-de-Fonds ...	24.9	30.6	18.3	73.8
" " " "	4212	H. Golay, London	24.0	32.9	16.1	73.0
Minute and split seconds chronograph	3001	Baume and Co., London	28.4	32.6	16.3	77.3
" " " "	02013	S. Smith and Son, London....	25.4	34.4	15.7	75.5
" " " "	13992	H. Golay, London	27.8	32.0	14.5	74.3
Minute and seconds chronograph	10950	Klaftenberger, London	28.2	36.8	15.7	80.7
" " " "	28106	Usher and Cole, London	26.5	35.2	16.4	78.1
" " " "	11437	Alf. M. Jacobs & Co., London	25.2	30.7	18.4	74.3
Ordinary seconds chronograph	97866	Rotherham and Sons, Coventry	25.9	33.4	14.1	73.4
" " " "	26768	Jos. Player, Coventry	22.7	37.0	13.1	72.8
" " " "	92489	Rotherham and Sons, Coventry	20.5	29.6	13.3	63.4
Minute repeater	82259	Rotherham and Sons, Coventry	24.2	29.5	16.7	70.4
" " " "	52782	A. E. Fridlander, Coventry ...	28.6	34.0	6.0	68.6
" " " "	17166	G. Oram and Son, London....	19.6	35.8	12.5	67.9